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**(54) Dental handpiece with lighting means**

Zahnärztliches Handstück mit Beleuchtungsmittel

Pièce à main dentaire avec moyen d'illumination

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## Description

[0001] The present invention relates to a dental handpiece, more specifically to a dental handpiece provided with lighting means for illuminating a treatment site in the patient's mouth during treatment.

[0002] US-A-4,477,252 discloses a dental handpiece which has the features included in the first part of claim 1. The light source is in the form of halogen lamp.

[0003] Fig. 2 illustrates a dental handpiece which is similar to that disclosed in US-A-4,477,252. The handpiece 30 has a turbine head 10' and a coupling 10". A halogen lamp 40 is disposed inside the coupling 10", and the light emitted by the lamp 40 is transmitted through a light transmitting fiber 42 such as rod fiber or glass fibers in the turbine head 10' to a projecting window 41 located in head 11 or neck 12 of the turbine head 10', which is to be positioned close to the treatment site.

[0004] The use of a halogen lamp has the following drawbacks:

(1) Halogen lamps employ filaments to generate light from electrical current passing therethrough. However, more than a small portion of the electrical current is converted to heat. Thus, the conversion efficiency from electric current to light is low, which increases the consumption of electric power. In addition, the heated filaments endanger the safety of the handpiece.

(2) Filaments tend to rupture due to the rotational vibration caused by a micromotor in the dental handpiece or high speed rotation mechanism in an angle type handpiece, or due to cutting vibration generated in cutting the treatment site. Therefore, filaments in the halogen lamps have low shock resistance and thus short service life.

(3) Halogen lamps and light transmitting fibers are not durable against steam when sterilized in an autoclave. Therefore, the lamps and the fibers require frequent re-placement and repair, which causes unreasonably high cost.

(4) Halogen lamps are too bulky to be disposed in the head or neck of the turbine head for direct illumination of the treatment site.

[0005] Accordingly, expensive light transmitting fibers should be used for light transmission, which render the handpiece structure complex. Further, light transmitting fibers attenuate the light emitted by the halogen lamp by more than 20 %.

[0006] In the field of display device, optical semiconductor devices are often used as optical display elements because of their quick on-off response. Further, optical semiconductor devices have been used as light sources for various measurements. For example, WO 95/07731 discloses a hand-held polymerization device including an array of light emitting semiconductor diodes. However, it has never been proposed to use an

optical semiconductor device as a lighting means in a dental handpiece.

[0007] It is an object of the present invention to provide a dental handpiece having lighting means in which electrical current is converted to light at high efficiency, which has high shock resistance, which has high resistance against steam when sterilized in an autoclave, and which is safe and durable. Also, dental handpiece having lighting means is in need which has a simple and inexpensive structure.

[0008] This object is met by the dental handpiece set forth in claim 1.

[0009] Fig. 1 is a partially exploded, schematic, perspective view of an embodiment of a dental handpiece of the present invention.

[0010] Fig. 2 is a partially exploded, schematic, perspective view of a conventional dental handpiece.

[0011] The present invention is now explained with reference to preferred embodiments taken in conjunction with attached drawings, but the present invention is not limited thereto.

[0012] Fig. 1 shows dental handpiece body 10 of the present invention, which has been disassembled into turbine head 10' and coupling 10". The turbine head 10' is made up of head 11 to which a dental treatment tool 1 is detachably secured, neck 12 extending proximally from the head 11, and grip 13 arranged at an angle to the neck 12 and which is held by the operator during use of the handpiece 10. The coupling 10" connects the turbine head 10' to a dental hose (not shown), which is in turn connected to a dental unit (not shown), to provide connections for various fluid passages and electrical joints in the handpiece body 10.

[0013] In the present invention, optical semiconductor device is used as lighting means. The optical semiconductor device may be a light emitting diode (LED), in particular a visible light-emitting diode (VLED).

[0014] In the present embodiment, VLED 20 is disposed in the lower distal portion of the neck 12 close to the head 11. VLED 20 is electrically connected to an external power supply (not shown). For example, VLED 20 is connected to lead wires 22 running through the turbine head 10' to contacts 23 at the proximal end of the turbine head 10'. Contacts 23 is in turn connected to contacts 23' in the coupling 10" to provide electrical connection between the turbine head 10' and the coupling 10". Contacts 23' is connected to lead wires 22' running through the coupling 10", which is then connected to the external power supply via a dental hose (not shown).

[0015] In the lower distal end portion of the neck 12, light projection window 21 is provided in alignment with VLED 20 so that the light emitted by VLED 20 is directed toward the tip of the tool 1 to illuminate the treatment site in the oral cavity of a patient.

[0016] Although, in the present embodiment, VLED 20 is shown and described to be disposed in the neck 12 of the handpiece 10, the VLED 20 may alternatively be disposed in the head 11 of the handpiece 10. In that

case, the light projection window 21 is provided on the head 11 in alignment with VLED 20 so that the illumination of the treatment site as described above may be achieved.

[0017] Further, VLED 20 may be disposed in the coupling 10", and the light emitted by VLED 20 may be transmitted through light transmitting means (not shown) such as optical fibers extending through the grip 13 and the neck 12 to the light projection window 21.

[0018] Since the dental handpiece of the present invention is provided with an optical semiconductor device as lighting means for illuminating the treatment site in the oral cavity of a patient, electric current is highly efficiently converted to light without employing filaments. Therefore, power consumption is reduced. For example, VLED 20 is operated at a low voltage of, for example, about 1.5 V to about 3 V, and at a low current of, for example, about 3 mA to about 50 mA. In addition, heat generation is substantially eliminated to ensure safety.

[0019] Further, elimination of filaments from the lighting means results in higher shock resistance and long service life of the lighting means. VLED is operative for, e.g., about not less than 100,000 hours.

[0020] Further, since the lighting means in the dental handpiece of the present invention is an optical semiconductor device, the size of the lighting means may be reduced, so that the lighting means may be disposed in the head or neck of the handpiece for direct illumination of the treatment site in a preferred embodiment of the present invention. Accordingly, the necessity for expensive optical fibers such as rod fiber or glass fibers may be eliminated, and attenuation of the light is minimized. Further, the structure of the handpiece is simplified, and the cost is reduced.

[0021] Since the dental handpiece of the present invention does not use a halogen lamp having a filament, the handpiece has improved durability against steam when sterilized in an autoclave, and thus frequent replacement and repair of lighting means are not necessary. In addition, use of optical fibers may also be eliminated in a preferred embodiment of the present invention, which further improves durability of the handpiece.

#### Claims

1. A dental handpiece (10) comprising a handpiece body (10', 10") including a turbine head (10'), a coupling (10") and a light source (20) for illuminating the site of treatment within the patient's mouth, characterized in that the light source is an optical semiconductor device (20) located in said turbine head (10').
2. The handpiece of claim 1, wherein said optical device (20) is a light emitting diode (LED).
3. The handpiece of claim 2, wherein said light emit-

ting diode is a visible light emitting diode (VLED).

4. The handpiece of claim 1, wherein said turbine head (10') has a head (11), a neck (12), and a grip (13), and wherein said optical device (20) is located in said neck (12).
5. The handpiece of claim 4, wherein said neck (12) has a light projecting window (21) in a distal portion of said neck (12), said window (21) being in alignment with said optical device (20).
6. The handpiece of claim 1, wherein said turbine head (10') has a head (11), a neck (12), and a grip (13), and wherein said optical device (20) is located in said head (11).

#### Patentansprüche

1. Zahnärztliches Handstück (10) mit einem Hauptteil (10', 10"), das einen Turbinenkopf (10'), eine Kuppelung (10") und eine Lichtquelle (20) zur Beleuchtung der Behandlungsstelle im Mund des Patienten enthält, dadurch gekennzeichnet, daß die Lichtquelle eine in dem Turbinenkopf (10') angeordnete Halbleitereinrichtung (20) ist.
2. Handstück nach Anspruch 1, wobei die optische Einrichtung (20) eine Leuchtdiode (LED) ist.
3. Handstück nach Anspruch 2, wobei die Leuchtdiode eine sichtbares Licht emittierende Diode (VLED) ist.
4. Handstück nach Anspruch 1, wobei der Turbinenkopf (10') einen Kopf (11), einen Hals (12) und einen Griff (13) aufweist und die optische Einrichtung (20) in dem Hals (12) angeordnet ist.
5. Handstück nach Anspruch 4, wobei der Hals (12) in seinem distalen Abschnitt ein auf die optische Einrichtung (20) ausgerichtetes Licht-Projektionsfenster (21) aufweist.
6. Handstück nach Anspruch 1, wobei der Turbinenkopf (10') einen Kopf (11), einen Hals (12) und einen Griff (13) aufweist und die optische Einrichtung (20) in dem Kopf (11) angeordnet ist.

#### Revendications

1. Pièce à main dentaire (10) comprenant un corps de pièce à main (10', 10") incluant une tête de turbine (10'), un accouplement (10") et une source de lumière (20) pour illuminer le site de traitement dans

la bouche du patient,  
**caractérisée en ce que la source de lumière est**  
un dispositif semiconducteur optique (20) situé  
dans ladite tête de turbine (10').

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2. Pièce à main dentaire selon la revendication 1,  
dans laquelle ledit dispositif optique (20) est une  
diode électroluminescente (LED).

3. Pièce à main dentaire selon la revendication 2, 10  
dans laquelle ladite diode électroluminescente est  
une diode émettant une lumière visible (VLED).

4. Pièce à main dentaire selon la revendication 1, 15  
dans laquelle ladite tête de turbine (10') comprend  
une tête (11), un cou (12), et une poignée (13), et  
dans laquelle ledit dispositif optique (20) est situé  
dans ledit cou (12).

5. Pièce à main dentaire selon la revendication 4, 20  
dans laquelle ledit cou (12) comporte une fenêtre  
de projection de lumière (21) dans une partie distale  
dudit cou (12), ladite fenêtre (21) étant en aligne-  
ment avec ledit dispositif optique (20).

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6. Pièce à main dentaire selon la revendication 1,  
dans laquelle ladite tête de turbine (10') a une tête  
(11), un cou (12), et une poignée (13), et dans la-  
quelle ledit dispositif optique (20) est situé dans la-  
dite tête (11).

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Fig. 1

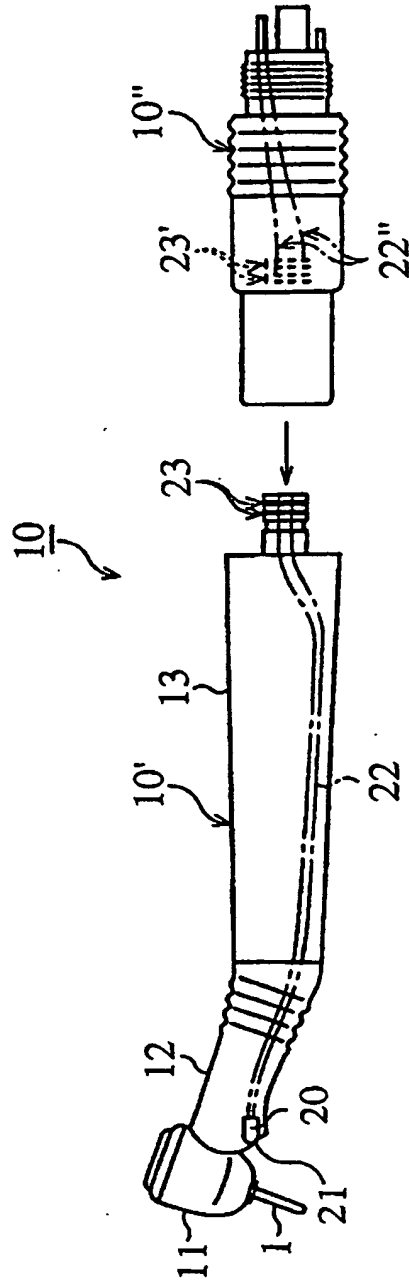


Fig. 2  
PRIOR ART

